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Research Note

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NATURAL ESTABLISHMENT OF PONDEROSA PINE IN CENTRAL IDAHO

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ABSTRACT

The rare coincidence of a good cone crop followed immediately by a comparatively cool, moist summer produced unusually abundant ponderosa pine seedlings in 1963. This paper compares natural stocking in 1963 with that recorded in 1959 following the usual severe summer weather of central Idaho.

In central Idaho, summers with weather conducive to seedling survival are rare, but they do occur. The coincidence of a ponderosa pine cone crop and a subsequent favorable growing season is even more rare. Such a coincidence occurred in 1963--the first since 1941--and provided an unusual opportunity to observe natural widespread establishment of ponderosa pine (Pinus ponderosa Laws.) seedlings.

Numbers of emerging seedlings in the spring of 1963 were noticeable, but not impressive. The possibility of an exceptionally successful regeneration year gradually became evident during July and August, when we observed that large numbers of seedlings were surviving the normal drought period. Live seedlings were growing in the most unusual places (figs. 1 and 2), such as in dense grass, in deep duff and litter, at the base of shrubs, and on old stumps and logs. In most years all of these seedlings would have succumbed to drought or to competition before the end of summer.

Weather in central Idaho, especially during the growing season, is usually a critical factor in the survival of forest reproduction. Annual precipitation, usually 20 to 24 inches, falls mostly in winter and spring. Summer rainfall is often only a trace, temperatures are high, and relative humidities from only 7 to 12 percent are common. This combination of severe climate and shallow, desiccative soils does not favor seedling survival and establishment in this part of the species' range.

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Figure 1.--The tap root of this live 1963 ponderosa pine seedling, photographed in October, had penetrated 3.5 inches of pine needle duff. Fifty-cent coin rests on mineral soil.

MEASUREMENTS

Since many seedlings were still alive in the fall, it was decided to record their numbers and distribution. The transects used in 1959 to study natural regeneration on scarified group cuttings on the Boise Basin Experimental Forest provided an opportunity to compare seedling survival in 1963 with that of a drier year.[2] The earlier study included measurements of seedfall and subsequent stocking on 36 scarified group cuttings and 11 unscarified sites. Limited time and manpower restricted the 1963 study to remeasuring six of the same clearcut groups--three scarified and three unscarified--and comparing climatic records for the two years.

Transects of continuous milacre quadrats employed in the 1959 study were used again to record quadrat stocking and numbers of seedlings. In November the presence or absence of at least one 1963 seedling and the total number of seedlings were recorded for each quadrat. Quadrat stocking and numbers of seedlings per acre were calculated from the presence of seedlings and numbers of seedlings tallied.

[2] Foiles, Marvin W., and James D. Curtis. Natural regeneration of ponderosa pine on scarified group clear cuttings in central Idaho. (In press.)

Figure 2.--This live 1963 ponderosa pine seedling, photographed in October, survived competition from dense grass.

WEATHER

What was responsible for the unusually successful natural regeneration in 1963? Why were seedlings able to survive even on normally severe sites despite vigorous vegetative competition?

Favorable weather was probably a major factor. The weather was relatively cool and moist during the summer months of 1963 (table 1). Total June precipitation in 1963 was almost 3 inches above average and 3.5 inches greater than that of June 1959. The precipitation in July 1963 was almost lacking, and in August was but a third of that in 1959. This low rainfall was partially offset by cool temperatures; the average temperature for July was nearly 4° below the 30-year mean.

Table 1.--Total precipitation and average temperatures in Idaho City, Idaho, for the summer months of 1959 and 1963

Month	Total precipitation			Average temperature			Days max. temp. 90° F. or above	
	1959	1963	30-year average	1959	1963	30-year average	1959	1963
	Inches			Degrees F.			Number	
June	0.66	4.15	1.24	61.0	58.2	58.6	2	0
July	0.00	0.02	0.27	67.6	62.9	66.8	20	1
August	1.42	0.45	0.30	62.2	64.8	64.9	6	12

Pine silviculturists generally agree that low moisture content of the soil during the growing season is a critical factor in survival of ponderosa pine seedlings. In 1963 the soil was moist in early July because of the heavy rains in late June. June precipitation had been deficient in 1959. The effect of shortage of soil moisture in 1959 was intensified by the long, hot, dry period in June, July, and August which totaled 50 consecutive rainless days. Within that dry period, 26 days had maximum temperatures of 90° F. or above. In contrast, July of 1963 had only 1 day with a maximum temperature of 90° F., and the average maximum temperature was 7.5° lower than in 1959. Thus, in contrast to July of 1959, which was hot and dry, July of 1963 was cool and dry, and resulted in higher survival of seedlings.

RESULTS

Seed.--Measurements of seedfall from the bumper cone crop of 1958 averaged 245,240 seeds per acre on the clearcut areas. Seedfall from the 1962 crop was not measured, but observations indicated that it was less than half that of the 1958 crop.

Stocking (quadrats).--Stocking was expressed as the percentage of milacre quadrats containing at least one seedling. On the stocked-quadrat basis the stocking percentage was higher in 1963 than in 1959 on five of the six areas; the sixth one was 100-percent stocked both years (table 2). The differences in stocking are most striking on the unscarified areas, where two of the three tracts were complete failures in 1959, but were stocked 67 and 92 percent in 1963. Both areas had been well stocked in the spring of 1959, but no seedlings survived the summer drought of that year. The differences on the scarified areas, although smaller than on unscarified sites, are important because in 1959 those sites were freshly scarified and free of competing vegetation, whereas by 1963 these sites were completely revegetated.

Stocking (number of seedlings).--Density of stocking was expressed as the number of live seedlings per acre at the end of the first growing season (table 2). In November 1963, all six areas contained at least 3,500 seedlings per acre, and five of the six areas were more densely stocked than in 1959. Even the unscarified areas contained 3,500 to 7,210 seedlings per acre in 1963. This seedling density was a marked contrast to that of the 1959 season in which all the seedlings died on two unscarified tracts and only 368 seedlings per acre survived on the third area.

Table 2.--Quadrat stocking and numbers of ponderosa pine in 1959 and in 1963 on clearcut groups in central Idaho after the first growing season

Aspect	Quadrats stocked		Seedlings per acre	
	1959	1963	1959	1963
	Percent		Number	
SCARIFIED IN 1958				
Northwest	73	93	7,400	12,133
West	37	78	1,000	4,259
Level (ravine bottom)	100	100	206,000	128,400
NOT SCARIFIED				
South	0	67	0	3,500
West	21	95	368	7,210
Level (ridge)	0	92	0	6,583

DISCUSSION

What will happen to the 1963 bumper crop of ponderosa pine seedlings?

From the standpoint of persistence, certainly numbers are in their favor. Many of them still face severe competition from grass, sedge, brush, and other vegetation for several years. However, they were helped through the critical first year by a cool damp summer. Some of these seedlings will thrive and become dominant fairly soon; others will struggle and fall behind their neighbors. Still others will perish from the multitude of destructive agents to which all young seedlings are subject. This pattern of intense competition is evident in the seedlings and saplings that became established 21 years earlier in the same general area. These 1941 seedlings now vary from a foot or so to some 30 feet in height depending on the competition they have endured. Some of them occur singly; others are in groups, depending on where they established themselves. They appear to have different ages, but actually they are the same age. The 1963 seedlings constitute yet another "wave" of reproduction, a newly added age class, of a typical ponderosa pine forest in central Idaho.

It is instructive to observe that from the silvicultural standpoint of planning for reproduction, it would have been impossible to anticipate the combination of events that culminated in the unusually abundant seedling establishment in 1963.

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